WHAT IS CLAIMED IS:

1. A mobile radio communication apparatus applicable to a plurality of radio communication systems, comprising:

5   a wireless transmitter-receiver device configured to perform transmission/reception of a radio signal;

a signal processing device including a resource to which functions are defined, wherein the resource handles at least a modem function and a protocol

10   function, and configured to perform a signal processing necessary in the transmission/reception by use of the resource; and

a controller which controls said signal processing device to redefine, to the resource, another modem

15   function and another protocol function corresponding to respective one of the mobile communication systems.

2. A mobile radio communication apparatus according to claim 1, wherein said signal processing device comprises:

20   a general-use processor serving as a part of said resource and configured to carry out a part of said signal processing by executing a given program; and

a signal processing unit serving as another part of said resource and configured to carry out another

25   part of said signal processing; and

said general-use processor comprises a register array configured to retain data directly

transmitted/received between the general-use processor itself and the signal processing unit.

3. A mobile radio communication apparatus according to claim 1, wherein said signal processing device comprises:

at least one programmable hardware device serving as a part of said resource and including a circuit structure capable of being redefined according to a set of a plurality of logic circuits which carry out basic calculations of at least a part of said signal processing; and

a general-use processor serving as another part of said resource and configured to carry out at least another part of said signal processing by executing a predetermined program; and

said controller determines respective shares of processing to be executed by said programmable hardware device and the general-use processor in accordance with the contents of said signal processing and controls said signal processing device to define, to the resource, the signal processing functions in accordance with determination of the share.

4. A mobile radio communication apparatus according to claim 1, wherein said signal processing device comprises:

at least one programmable hardware device serving as at least a part of said resource and including

a circuit structure capable of being redefined
according to a set of a plurality of logic circuits
which carry out basic calculations of at least a part
of said signal processing;

5   a first memory which stores a program indicating
a procedure of said signal processing;

a second memory which stores a plurality of
circuit structure descriptions of said programmable
hardware device corresponding to processing contents

10   respectively, the circuit structure descriptions being
used for said signal processing device to carry out
said signal processing; and

a program sequencer configured to control the
programmable hardware device and said second memory to

15   revise the circuit structure descriptions of said
programmable hardware device in accordance with the
program read out from said first memory under a control
of said controller.

5.   A mobile radio communication apparatus

20   according to claim 4, wherein said signal processing
device further comprises a general-use processor
serving as another part of said resource and configured
to carry out at least another part of said signal
processing by executing a given program; and said

25   program sequencer determines respective shares of
processing to be executed by said programmable hardware
device and the general-use processor in accordance with

the program read out from said first memory , selects

one of said plurality of circuit structure descriptions

stored in said second memory in accordance with

determination of the shares and supplies selected

5   description to said programmable hardware device, and

gives an execution instruction of the processing to be

shared by said general-use processor to said general-

use processor.

      6. A mobile radio communication apparatus

10   applicable to a plurality of radio communication

systems, comprising:

      a wireless transmitter-receiver device configured

to perform transmission/reception of a radio signal;

      a signal processing device including a resource to

15   which signal functions are defined, and configured to

perform a signal processing necessary in the

transmission/reception by use of the resource; and

      a controller which controls said signal processing

device to redefine, to the resource, a newly required

20   signal processing function in accordance with a

resource amount necessary for redefining the newly

required signal processing function of the resource and

a residual resource amount.

      7. A mobile radio communication apparatus

25   according to claim 6, wherein said controller acquires

structure description information indicating a

structure of said newly requested signal processing

function provided from an outside of said radio communication apparatus, and controls said signal processing device to define, to the resource, the newly required signal processing function in accordance with

5 a resource amount necessary for defining the newly required signal processing function of the resource and an excessive residual resource amount, with use of the acquired structure description information.

8. A mobile radio communication apparatus

10 according to claim 6, wherein

(a) said controller acquires structure description information provided from outside of said radio communication apparatus via said wireless transmitter-receiver device, the structure description information

15 indicating a structure of said newly requested signal processing function;

(b) said controller obtains a resource amount necessary for defining, to the resource, the newly required signal processing function of the resource

20 with use of the acquired structure description information;

(c) said controller compares said resource amount obtained and an initial resource amount preset in said signal processing device with each other;

25 (d) said controller grasps said excessive source amount when the obtained resource amount is smaller than the initial resource amount;

(e) said controller determines if it is possible to additionally define said newly requested signal processing function to said resource by comparing the grasped excessive resource amount with the resource

5   amount necessary for defining, to the resource, the newly required signal processing function of the resource; and

(f) said controller executes an additional definition when it is determined that the additional

10   definition can be done.

9. A wireless system comprising:

the mobile radio communication apparatus according to claim 7; and

an information providing apparatus configured to

15   provide the structure description information to said controller of said mobile radio communication apparatus.

10. A wireless system according to claim 9, characterized in that said information providing

20   apparatus is installed in a base station which carries out radio communications with said mobile radio communication apparatus.

11. A wireless system according to claim 9, wherein said wireless transmitter-receiver device is

25   configured to perform transmission/reception of a radio signal with said information providing apparatus; and

said information providing apparatus comprises:

an another wireless transmitter-receiver device configured to perform transmission/reception of a radio signal with said mobile radio communication apparatus; and

5 an another controller configured to control said another wireless transmitter-receiver device to provide the controller with information for defining, to the resource, the newly required signal processing function in accordance with the resource amount and the

10 excessive residual resource amount, the resource amount and excessive residual resource amount being grasped based on information acquired by the another controller and containing a use status of said resource.

12. A mobile radio communication apparatus

15 applicable to a plurality of radio communication systems, comprising:

a wireless transmitter-receiver device configured to perform transmission/reception of a radio signal;

a signal processing device including a resource

20 capable of redefining a signal processing function based on a predetermined software module, and configured to perform a signal processing necessary in the transmission/reception by use of the resource; and

a storage device configured to store a plurality

25 of software modules respectively corresponding to said plurality of radio communication systems; and

a controller which reads out at least one software

module corresponding to one of the mobile communication

systems which is used by said mobile radio

communication apparatus from said storage device , and

controls said signal processing device and said storage

5   device to supply the read-out software module to the

resource.

13. A mobile radio communication apparatus

according to claim 12, wherein said storage device is

configured further to store a plurality of software

10   modules respectively corresponding to a plurality of

communication systems of different types; and

said controller is configured to read out at least

one software module corresponding to a type of

communication conducted by said mobile radio

15   communication apparatus from said storage device and to

control said signal processing device and said storage

device to assign the read-out software module to the

resource.

14. A mobile radio communication apparatus

20   according to claim 12, wherein said controller

characterized by comprises:

a resource manager configured to manage a timing

for determining a rewriting order of the software

modules in the resource, whether or not the software

25   modules should be rewritten, and a timing for

rewriting; and

a rewrite processor configured to read out

a predetermined one of the software modules from said

storage device based on an instruction from said

resource manager and to assign the read-out module to

the resource thereby rewriting the software modules in

5   the resource.

15.   A mobile radio communication apparatus

according to claim 12, wherein said controller

comprises:

a resource manager configured to manage a timing

10   for determining a rewriting order of the software

modules in the resource, whether or not the software

modules should be rewritten, and a timing for

rewriting;

a download buffer configured to buffer at least

15   one software module downloaded from outside; and

a rewrite processor configured to read out at

least one software module from at least one of said

storage device and said download buffer based on an

instruction from said resource manager and to assign

20   the read-out module to the resource thereby rewriting

the software modules in the resource.

16.   A mobile radio communication apparatus

applicable to a plurality of radio communication

systems, comprising:

25   a wireless transmitter-receiver device configured

to perform transmission/reception of a radio signal;

a signal processing device including a resource

to which signal functions are defined based on

a predetermined software module, and configured to

perform a signal processing necessary in the

transmission/reception by use of the resource;

5   a storage device configured to store a plurality

of software modules respectively corresponding to

a plurality of signal processing functions executed by

said signal processing device, and a table which

records at least a use log of each of said plurality of

10   software modules; and

a controller which controls said signal processing

device and said storage device to read out at least one

software module corresponding to a signal processing

function to be executed by said signal processing

15   device from said storage device, to assign the read-out

software module to said signal processing device, and

to rewrite at least one of the software modules stored

in said storage device with reference to the table.

17.   A mobile radio communication apparatus

20   according to claim 16, wherein said storage device

stores a use frequency of each of said plurality of

software modules in the table as a use log of each of

the software modules; and

said controller controls said storage device to

25   rewrite the software modules by deleting one software

module with a minimum use frequency of said plurality

of software modules stored in said storage device with

reference to the table.

18. A mobile radio communication apparatus according to claim 16, wherein said storage device stores a latest use date and time of each of said plurality of software modules in the table as a use log of each of the software modules; and

said controller controls said storage device to rewrite the software modules by deleting one software module with an oldest use data and time of said plurality of software modules stored in said storage device with reference to the table.

19. A mobile radio communication apparatus according to claim 16, wherein said storage device stores a size of each of said plurality of software modules in the table as a use log of each of the software modules; and

said controller controls said storage device to rewrite the software modules by deleting one software module with a largest size of said plurality of software modules stored in said storage device with reference to the table.

20. A mobile radio communication apparatus according to claim 16, wherein said storage device stores a version of each of said plurality of software modules in the table as a use log of each of the software modules; and

said controller controls said storage device to

compare a version of at least one software module corresponding to a signal processing function to be executed by said signal processing device with the versions of the software modules stored in said storage

5   device with reference to the table, and when the versions of these software modules are equal to each other, said controller reads the software modules from said storage device and assigns the read-out modules to said signal processing device.

10   21. A mobile radio communication apparatus according to claim 20, wherein said controller further comprises a download buffer configured to buffer at least one software module downloaded from outside, and controls said signal processing device to download at

15   least one software module corresponding to a signal processing function to be executed by said signal processing device when the versions of these software modules are not equal to each other, to buffer it to said download buffer and assign the buffered module to

20   said signal processing device.

           22. A radio communication apparatus applicable to a plurality of radio communication systems, comprising:

               a wireless transmitter-receiver device configured to perform transmission/reception of a radio signal;

25   a signal processing device including a resource to which signal functions are defined based on a predetermined software module, and configured to

perform a signal processing necessary in the transmission/reception by use of the resource;

a storage device configured to store a plurality of software modules respectively corresponding to a plurality of signal processing functions executable by said signal processing device in correspondence with the radio communication systems , a plurality of first data files each having a file format corresponding to unique application software prepared for each of the radio communication systems, and a second data file having a common file format;

a first converter device configured to execute conversion of at least one of said plurality of first data files stored in said storage device into the second data file, and newly store the second data file in said storage device;

a second converter device configured to execute conversion of at least one of said plurality of second data files stored in said storage device into at least one first data file; and

a controller configured to control said signal processing device and said storage device to read out a software module corresponding to a predetermined one of the radio communication systems from said storage device and to assign the read-out software module to said signal processing device.

23. A mobile radio communication apparatus

according to claim 22, wherein said controller includes a processor;

said first converter device executes conversion as said processor executes a first software for conversion; and

said second converter device executes conversion as said processor executes a second software for conversion.

24. A mobile radio communication apparatus according to claim 22, wherein said second converter device converts at least one of the second data files stored in said storage device into a first data file having a file format corresponding to unique application software prepared for said predetermined one mobile communication system, when said controller reads out the software module corresponding to said predetermined one of the radio communication systems from said storage device and assigns the read-out software module to said signal processing device.

25. A mobile radio communication apparatus according to claim 22, wherein said application software includes a telephone directory management software and said storage device stores a telephone number file as the first and second data files.

26. A mobile radio communication apparatus according to claim 22, wherein said application software includes a browsing software for Web pages and

said storage device stores a URL (uniform resource locators) file as the first and second data files.

27. A mobile radio communication apparatus according to claim 22, wherein said application software includes an e-mail software and said storage device stores an e-mail file as the first and second data files.

28. A mobile radio communication apparatus according to claim 22, wherein said application software includes an e-mail software and said storage device stores a mail address file as the first and second data files.